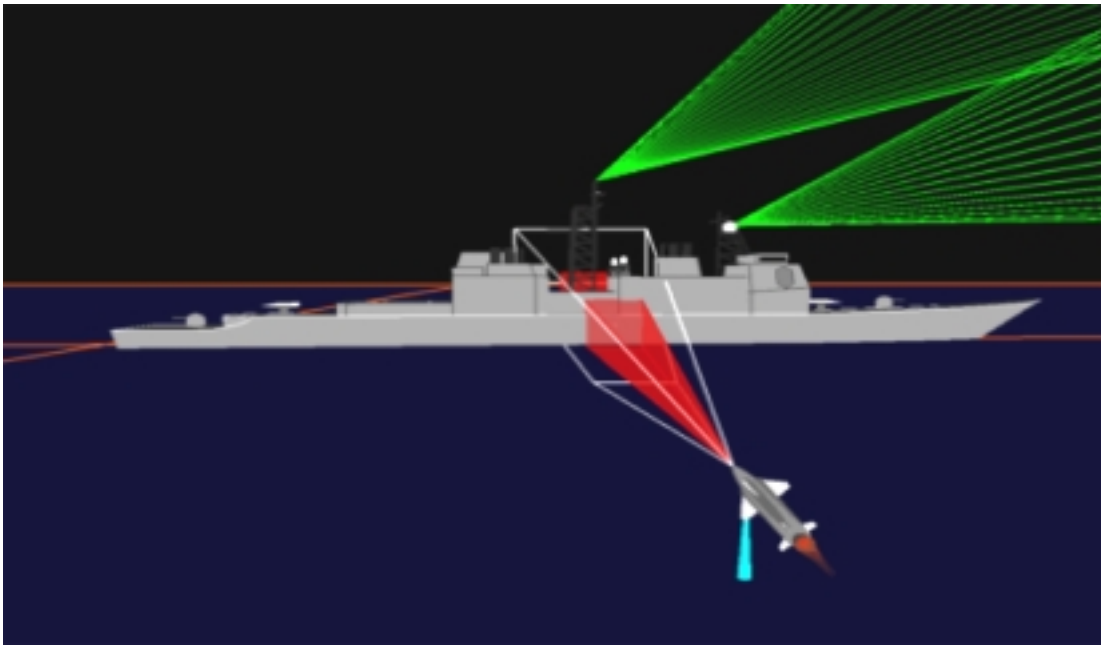
Visualization Laboratory



Visualization Laboratory

FUNCTION: Evaluates and improves the operational effectiveness of existing and emerging electronic warfare systems. By analyzing and visualizing the results of scenarios, the requirements in design, tactics, and training are assessed.

INSTRUMENTATION: The Visualization Laboratory is equipped with advanced computer graphics workstations, large display monitors, software tools, and video production equipment. Approximately 40 Silicon Graphics workstations are used for software development and to interactively design and visualize simulations. A fiber-optic network is in place to display results in conference rooms and auditoriums.

DESCRIPTION: The Visualization Laboratory evaluates and improves the operational effectiveness of existing and emerging electronic warfare systems. By analyzing and visualizing the results of scenarios, the design, tactics, and training are assessed. Three-dimensional computer graphics are used to display parameters in an intuitive manner, providing depth, volume, and spatial information. Several analysis routines exist to review the static and dynamic components of the simulation. Static analysis tools convey attributes such as number of platforms, missiles, and emitters used within the simulation, the location of emitters on various platforms, and their characteristics. Dynamic analysis tools convey information about time variant components, the number of emitters detectable, their bearing, and operation mode. Digital terrain elevation data are used to provide accurate representation of geographical areas. Multimedia interfaces to naval platform and Geographical Information System databases also exist.

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Off-Board Test Platform

Off-Board Test Platform

FUNCTION: Measures the aerodynamic forces and moments and studies the airflow characteristics over off-board countermeasures deployment vehicles. Supports the development and testing of propulsion systems for deployment vehicles. This facility is especially suited to the study of subsonic low Reynolds number aerodynamics because of its low turbulence intensity.

INSTRUMENTATION: The aerodynamic test section has a full 3-axis, 6-component strain gauge balance; a 48-port scanivalve pressure measurement system; and an automated data collection system.

DESCRIPTION: This facility is particularly focused on the development of air vehicles designed to operate at low speed, low altitude, and low Reynolds number. The wind tunnel is a continuous flow design that operates over a range of 20 to 200 kts and has two interchangeable test sections. The aerodynamic test section has a 4 × 4-ft cross section and a full 3-axis, 6-component strain gauge balance. Models are attached to the balance "sting," which can be manually or automatically controlled to sweep through ranges of angle of attack and sideslip, while force and moment data are collected. The propulsion test section is used to develop electric, internal combustion, and miniature turbojet engines. It features an open-jet test section and provides a simulation of in-flight airflow conditions.

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Transportable Radar Cross Section Measurement Radar (TSFR)

Transportabke Radar Cross Section Measurement Radar

FUNCTION: Provides a mobile facility to characterize and quantify the radar cross section (RCS) signature of ships and electronic warfare (EW) passive and active systems over 8 to 18 GHz and at 35 GHz. Additionally, the system can measure the Effective Radiated Power (ERP) and sensitivity of active EW systems over the same frequency range.

INSTRUMENTATION: The data radar is calibrated by using a combination of internal and external procedures. Effective radiated power (ERP), sensitivity, and RCS data are collected on a pulse-by-pulse basis using fast analog-to-digital converters (ADCs) and data collection and storage systems. The target of interest from each radar pulse is digitized and stored for post-test data processing. Data processing is very flexible, with the form of the processed data tailored to user requirements.

DESCRIPTION: The facility consists of I-band tracking radar, an optical designator to aid in target acquisition, a broadband 1-kW traveling wave tube (TWT) based radar for ERP, RCS, and sensitivity measurements, and a 60-kW, 35 GHz radar. Radar parameters such as pulse repetition frequency, pulse width, frequency, transmit polarization, and receive polarization are programmable. RCS measurements can be made at selectable transmit polarizations with received polarization switchable on a pulse-by-pulse basis if required. All three radars are housed in an 8 × 24-ft instrumentation hut with all antennas and a 60-kW diesel generator mounted on a 45-ft trailer that can be moved to any test range where measurements are to be made.

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Vehicle Development Laboratory

The High Resolution Airglow and Aurora Spectroscopy (HIRAAS) experiment during ground testing

FUNCTION: Supports the development of prototype deployment platform vehicles for off-board countermeasures systems.

INSTRUMENTATION: The Vehicle Development Laboratory has supporting equipment and instrumentation associated with prototype flight testing such as radio control systems, miniature autopilot, video cameras, data collection systems for both onboard and radio frequency (RF) telemetry, and a variety of sensors such as accelerometers, gyros, airspeed, and altitude transducers.

DESCRIPTION: The Vehicle Development Laboratory is involved in areas of technology development related to off-board countermeasure deployment platforms. These activities include research in new airframe materials and fabrication techniques, low-cost flight control sensors and controllers, and low Reynolds number airfoil design. Full-scale and subscale remote control and autonomous prototype vehicles are fabricated and flight tested. Also, avionics subsystems and deployment mechanisms are refined through flight testing aboard various remotely piloted test aircraft operated by the laboratory.

The Vehicle Development Laboratory has a substantial capability to fabricate airframe and mechanism test articles, light metal working, and composite structures.

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Advanced Tactical Electronic Warfare Environment Simulator (ATEWES)

Advanced Tactical Electronic Warfare Environment Simulator

FUNCTION: Provides real-time, hardware-in-the-loop test and evaluation of electronic warfare (EW) sensor systems and concepts in the 0.5 to 18.0 GHz microwave range.

INSTRUMENTATION: ATEWES uses a complete complement of laboratory microwave instrumentation: network analyzers, spectrum analyzers, microwave frequency counters, power meters, microwave synthesizers, digital-controlled oscillators, function generators, and solid-state amplifiers. Internal data recording includes a record of simulation data and signal-level pulse history of all pulses delivered to the system that is under test. Computer displays include interactive graphics operator terminal and 3-D color graphics situation display.

DESCRIPTION: ATEWES is a general-purpose system designed to provide complex and realistic radio frequency (RF) signal environments for laboratory testing and evaluation of modem EW/ESM (electronic warfare/electronic support measures) systems. The most significant aspect of the ATEWES is its ability to generate a near real-world dynamic RF environment consisting of up to 1,000 simultaneous signals with a combined pulse density of 1,000,000 pps. Frequency coverage of 0.5 to 0.18 GHz and hemispheric spatial coverage with azimuth and elevation accuracies of approximately 1.0 mrad are provided. This overall capability is driven by an operator-defined scenario that can be rapidly programmed for operational use. This level of performance permits laboratory evaluation of modern EW/ESM systems under controlled conditions and can minimize or avoid costly at-sea or flight testing, while allowing new system development and concepts to transition to the Fleet with reduced time and cost. Recent ATEWES enhancements include complex features for evaluating real-time battle force engagements in 3-D space. ATEWES can be configured to interface with the system-under-test through a variety of means that include direct-coupling, free-space radiated in interface with (and combined utilization of) the Central Target Simulation anechoic chamber.

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Mobile ESM Laboratory

Mobile ESM Laboratory

FUNCTION: Accommodates a wide range of electronic systems testing operations in a variety of environments. It has the ability to install large amounts of electronic equipment and provide facilities for operations, maintenance, and engineering support for field testing and research.

INSTRUMENTATION: Test equipment is provided for the mobile laboratory depending on the experiments to be run (i.e., receivers, oscilloscopes, antennas, and signal processors).

DESCRIPTION: The Mobile ESM Laboratory is a fully self-contained mobile laboratory. The basic structure is a heavy duty diesel truck containing a standard 22-ft aluminum van body. The truck mechanical systems include a lift tailgate, leveling and stabilizing systems, and a roof hoist. Self-contained power generation capabilities include a diesel powered, 12 kW, 60 Hz generator with power regulator and a 2 kVA, 400 Hz, 3-phase converter. Two permanently mounted pneumatic mast systems with controllers permit elevation of 200-lb loads to heights more than 40 ft above the van roof level. Auxiliary support systems include video cameras, marine radars, communication systems, and a global positioning satellite (GPS) receiver. The internal work space includes multiple 19-in. racks for mounting electronic systems, various work tables, and storage cabinets. The van is provided with a full complement of environmental control systems.

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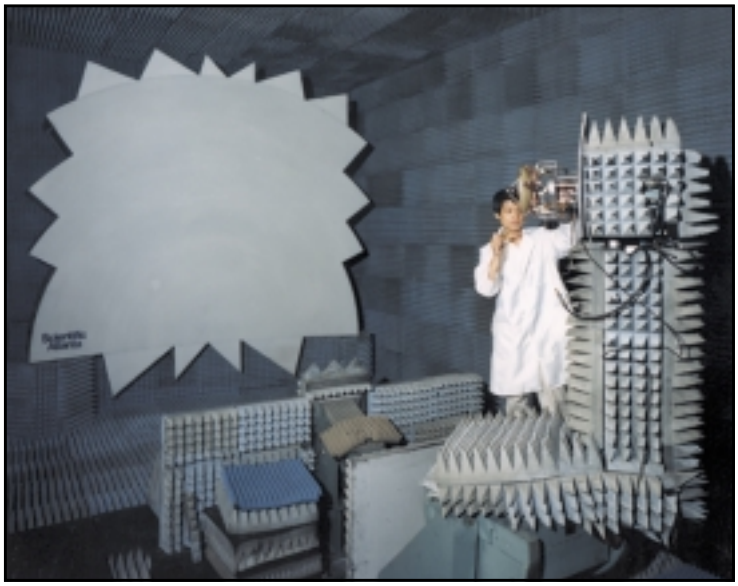
Compact Antenna Range Facility



Compact Antenna Range Facility

FUNCTION: Supports the measurement of phase and amplitude pattern characteristics of antenna systems over a frequency range of 2.0 to 90.0 GHz in a controlled environment. The facility also provides the capability for radar cross section (RCS) measurements from 2.0 to 40.0 GHz and small device characterizations from 450 MHz to 50.0 GHz.

INSTRUMENTATION: The Compact Antenna Range Facility uses a complete complement of microwave laboratory instrumentation, including network analyzers, microwave receivers, spectrum analyzers, microwave frequency counters, power meters, function generators, and microwave synthesizers. Data recording instrumentation includes an analog strip-chart recorder, an X-Y plotter, and a digital recorder. RCS measurements are made by using a Hewlett-Packard 8530 microwave receiver. Currently, four simultaneous channel measurements can be made to characterize an antenna or the RCS of a target in the 2.0 to 26.0 GHz frequency range. A Hewlett-Packard 8510C automatic network analyzer is available for small device characterization.

DESCRIPTION: The facility is an anechoic chamber that is designed to operate in conjunction with a Scientific Atlanta Compact Range Model 5751 with millimeter wave (MMW) reflector. The compact antenna range facility consists of a shielded anechoic chamber (18 ft high $\times$ 22 ft wide $\times$ 40 ft long) and a geometry that enables farfield radiation patterns to be taken in a small space. Illumination of the MMW reflector at one end of the chamber provides a cylindrical quiet zone (4 ft in diameter $\times$ 6 ft long) in which all the radiation patterns are measured. The quiet zone is specified to provide $\geq$ 45 dB of background noise isolation from 2.0 to 8.0 GHz and $\geq$ 50 dB from 8.0 to 94.0 GHz. The amplitude taper is specified to be $\leq$ 0.5 dB over the quiet zone, with a corresponding specification of $\leq 10^\circ$ phase taper. Test antennas or subsystems are positioned by attaching them to an azimuth-over-elevation mount. Further degrees of freedom (DOF) are allowed with the mounting point being on a roll axis and the entire positioner on a slide axis. A second roll axis is provided for source illumination and enables the source polarization to be quickly rotated.

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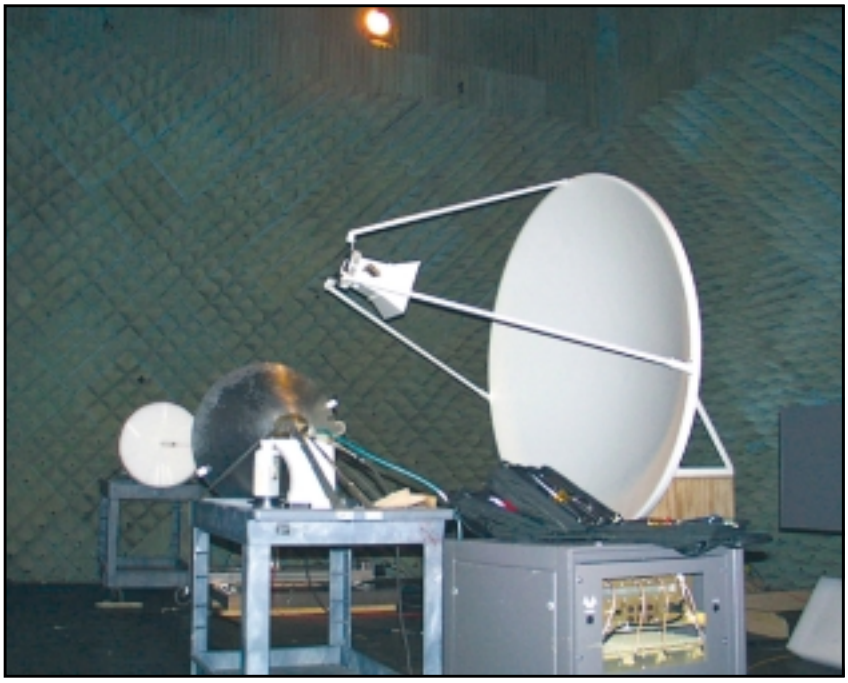
Isolation Measurement Chamber Facility



12-ft antenna dish in the Isolation Measurement Chamber

FUNCTION: Provides the capability for measuring antenna-to-antenna radiation coupling characteristics from 2.0 to 40.0 GHz. The configuration, size, and special handling equipment of the facility allow for accommodation of large antennas and devices that are under test. The facility also supports making accurate measurements of the radar cros section (RCS) of small cross-section objects.

INSTRUMENTATION: This facility has no dedicated instrumentation; users supply their own measurement equipment. Typically a Hewlett-Packard 8510C automatic network analyzer is configured to make RCS measurements of targets in the chamber. A number of different size RCS calibration spheres and antennas up to 40.0 GHz are available.

DESCRIPTION: The facility is a shielded anechoic chamber that is 24 ft wide × 30 ft long × 50 ft high. The quiet zone is located at the base of the chamber and has an extent of 12 ft wide × 18 ft long × 10 ft high. Quiet zone reflectivity measurements (i.e., dB below incident power) are >75 dB at 2.0 GHz, >85 dB at 4.0 GHz, >95 dB at 6.0 to 8.0 GHz, and >100 dB at 18.0 GHz. The chamber walls facing the control room are designed to be removed to allow installation of large targets.

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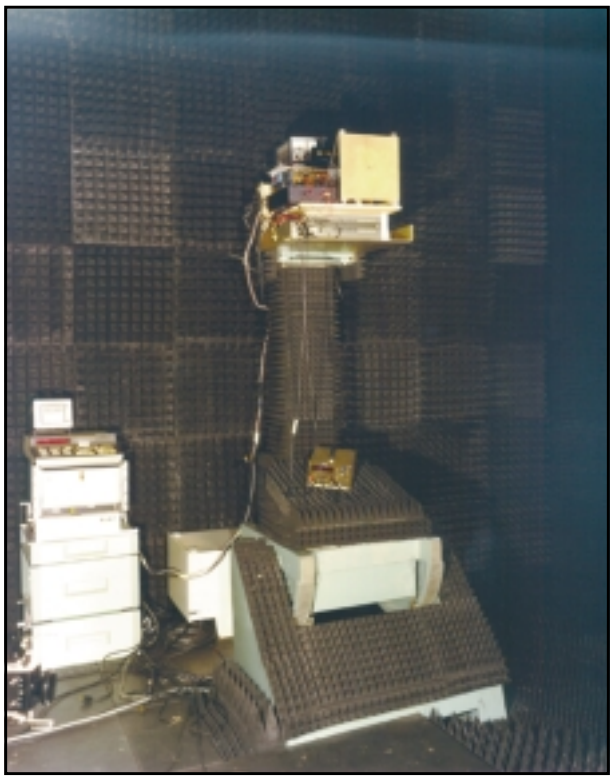
Millimeter Wave Anechoic Chamber Facility



MMW transmitter and aperture mounted in the Millimeter Wave Anechoic Chamber Facility

FUNCTION: Measures antenna radiation patterns and other low-power millimeter wave (MMW) measurements over a frequency range of 8.0 to 100.0 GHz. The facility also provides the means to measure the radio frequency (RF) characteristics of radomes intended for use in homing missiles or other target tracking radar systems.

INSTRUMENTATION: The MMW anechoic chamber facility was designed to operate with a Scientific Atlanta Model 5751 Compact Range instrumentation. One Scientific Atlanta antenna mount has a 125-lb weight limit and is centered in the quiet zone. This mount has roll, azimuth, and elevation control. The mount at the other end of the chamber has only roll angle adjustment. Control of the mount orientations is done remotely. Scientific Atlanta RF synthesizers up to 40.0 GHz are available. Also available are a full range of pyramidal standard gain horn antennas and mixers operating up to 100.0 GHz. The facility can operate with a Hewlett-Packard 8510C automatic network analyzer that has a capability up to 50.0 GHz.

DESCRIPTION: The facility is a shielded anechoic chamber that is 16.5 ft wide × 28.5 ft long × 16 ft high lined with radar absorber. The quiet zone is a 3-ft diameter sphere located at one end of the chamber. Quiet zone reflectivity measurements, i.e., dB below incident power, are >40 dB between 8.0 to 18 GHz, and >50 dB between 18.0 to 100.0 GHz. At each end of the chamber are antenna mounts.

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Low-Power Anechoic Chamber

Low-Power Anechoic Chamber for EA techniques development

FUNCTION: Develops and evaluates the effectiveness of electronic attack (EA) techniques against antiship cruise missiles. All terminal EAs programmed in the active AN/SLQ-32(V) area threat libraries are developed, tested, and evaluated in this facility in open- and closed-loop test configurations. Measures of effectiveness of the EA waveforms against the missiles are obtained through closed-loop testing.

INSTRUMENTATION: EA equipment includes operational Fleet techniques generator, advanced waveform generators including capability to do cross-pole jamming and programmable fiber-optics delay line to replicate frequency agile return signals delayed in time and closing at antiship missile velocities. The facility instrumentation assets include Astro-Med strip-chart recorder, X/Y plotter, radio frequency (RF) spectrum analyzer, oscilloscopes, RF power meter, and microwave sources for generating target signatures, including traveling wave tube (TWT) and solid-state, microwave, and wide-band amplifiers.

DESCRIPTION: The hardware-in-the-loop facility is instrumented to test antiship missiles operating in the I and J band of the frequency spectrum with the capability for up to two targets, such as a ship and chaff, in the scenarios. The two targets alternatively can also be implemented to simulate two ships, each having an onboard active electronic warfare (EW) system. Missile radar seekers are mounted on a two-axis pedestal that allows closed-loop evaluation in the azimuth and elevation planes. The engagement and associated kinematics are developed using computer-controlled interactions between the pedestal, a fixed and a moving horn. The fixed horn is implemented using synthetic line of sight. Signals radiated in the direction of the missile radar seeker simulate targets as seen by the missile seeker, including pulse-by-pulse seeker antenna patterns, ship cross-sectional area, range attenuation, and scintillation effects. EA returns are radiated to also include the effects of seeker antenna patterns, range attenuation, and realistic jamming-to-signal ratios. The missile autopilot aerodynamics modeling is done in real time by using an Applied Dynamics ADRTS dynamic simulation system with the capability of collecting and displaying more than 50 channels of data. The antiship missile model library includes many of today's threats.

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Search Radar ECM/EA Simulator (SRES)

Search Radar ECM/EA Simulator (left) and coastal defense radar (right)

FUNCTION: This facility tests the effectiveness of electronic countermeasures/electronic attack (ECM/EA) equipment and techniques for jamming airborne search and targeting radars.

INSTRUMENTATION: Resident EA equipment includes noise sources, false target generators, and ALQ-99 and SLQ-32 techniques generators. Radar equipment includes a coastal defense radar system, two PPIs, A and B scopes, and other radar receivers. Additional data recording devices are a line printer for simulator data hard copy, photographic and S-VHS video recording of radar displays, and a microwave spectrum analyzer with camera.

DESCRIPTION: The Search Radar EA Simulator (SRES) is an electronic laboratory for developing EA techniques and for testing EA equipment. It simulates the engagement between an airborne threat search radar and a group of surface ships and aircraft that use EA as part of their defense. The simulation generates radio frequency (RF) signals in real time that would be present in the threat radar receiver as measured from the radar echoes and EA. These signals are processed by the radar receivers and presented on radar displays for man-in-the-loop determination of EA effectiveness. An effective EA prevents the radar operator from determining the preferred target's location.

The simulator is housed in an RF-shielded room with both 60 and 400 Hz electrical power. A computer controls microwave attenuators and switches to generate the simulated radar signals. A separate Pentium personal computer controls the simulation through a graphical user interface for scenario entry. SRES uses human radar operators to achieve actual man-in-the-loop target determination and EA effectiveness.

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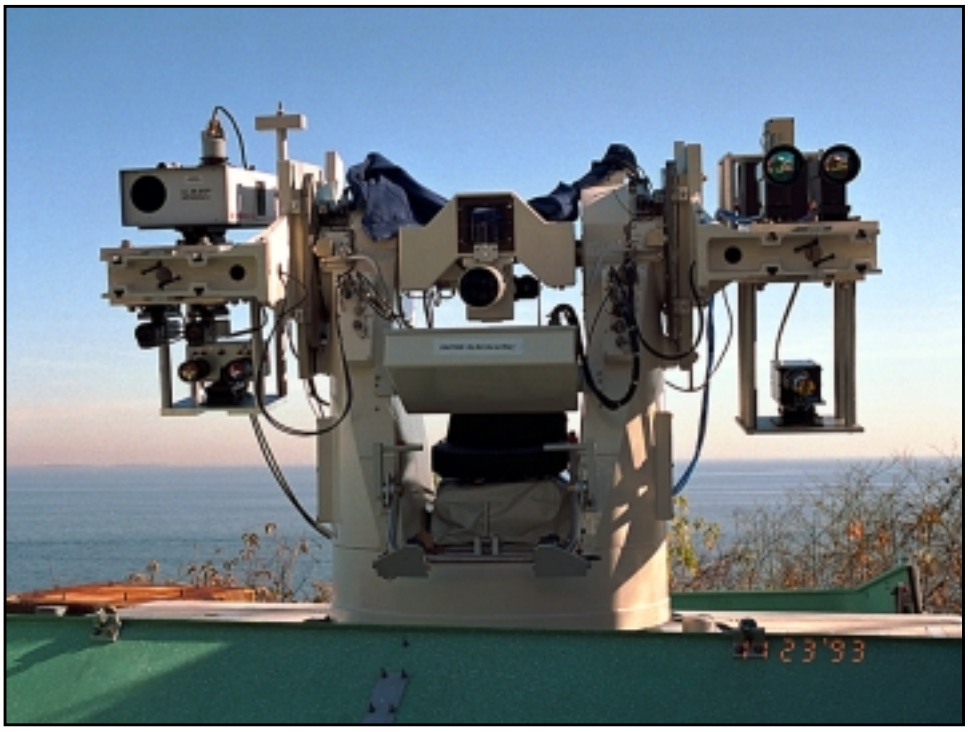
Electro-Optics (E/O) Mobile Laboratory



Electro-Optics Mobile Laboratory

FUNCTION: Provides quantifiable infrared (IR) spatial and spectral radiometric measurements of various types of targets. Typical targets are ships, aircraft, or IR decoy.

INSTRUMENTATION: Electro-Optics (E/O) Mobile Laboratory test equipment includes weather, ranging, video, and electro-optical instruments. Radiometric and imaging instruments are calibrated and characterized before each test. Equipment currently in use includes: two Bomem DA2 series FTIR interferometer spectrometers (2 to 12 μm), CI Systems SR-5000 (3 to 12 μm), Minarad SA-1000 circular variable filter radiometer (1.4 to 5.9 μm), two 2100 Inframetric imagers (dual band), and other imagers. Calibrations are verified in the field with IR blackbody sources to assure accuracy and consistency.

DESCRIPTION: The E/O Mobile Laboratory is a specially modified, fully instrumented vehicle and a trailer-configured precision tracking mount. This facility provides the work space, storage, and power for instrumentation racks and their operators. Front-end optics and electronics are boresighted on the Kineto tracking mount to provide stable platform. The mount provides motions of 640° azimuth and 90° elevation at up to 60°/s. Full velocity can be reached within 1 s from a standing position with a full load of 300 lb on each arm and the operator. This mobile laboratory is outfitted for visual and IR imagery, which can be used for tracking or spatial measurements. High-precision IR radiometers and interferometers provide calibrated measurements in both 3 to 5 μm and 8 to 12 μm bands. A full data acquisition system permits archiving and prompt data reduction.

CONTACT:
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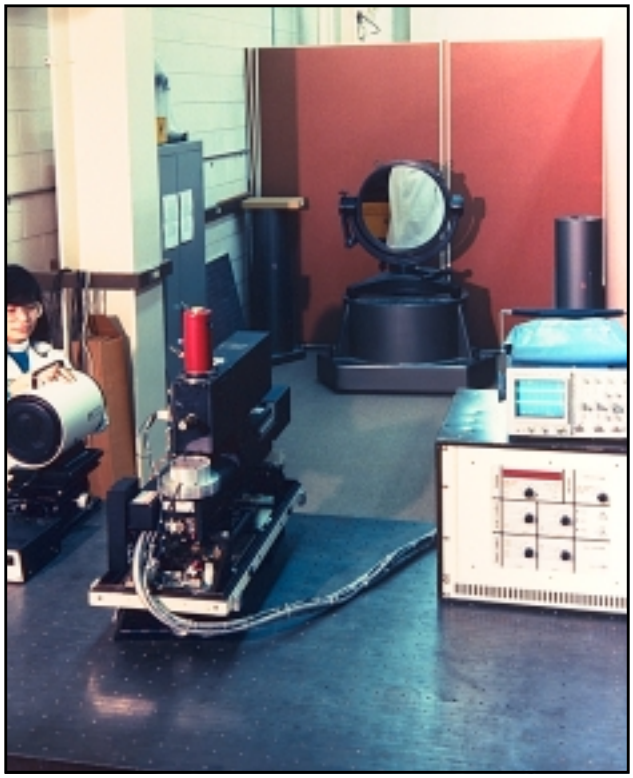
Infrared/Electro-Optical Calibration and Characterization Laboratory



Infrared/Electro-Optical Calibration and Characterization Laboratory

FUNCTION: Enables the optical characterization of infrared (IR) materials and precise calibration of IR radiometric and spectroscopic instrumentation.

INSTRUMENTATION: Included are state-of-the-art instruments and devices. Calibration is carried out with precision IR calibration sources and a 24-in. diameter, 200-in. focal length, off-axis collimator. IR paints and materials are characterized by several instruments such as a Perkin-Elmer spectrophotometer (transmittance and specular reflectance) and two Bomem FTIR integrating spheres for visual and IR bands, giving values for total and diffuse reflectance. These calibrations can be carried out at several ambient temperatures using a Tenny environmentally controlled chamber.

DESCRIPTION: The Infrared/Electro-Optical Calibration and Characterization Laboratory is an essential element of NRL IR signature measurement and signature control programs. Naval Sea Systems Command-supported ship signature measurement and ship decoy development programs rely on this laboratory for accurate calibration of instruments such as interferometer spectrometers, circular variable filter radiometers, and IR imaging radiometers. For IR signature control programs, the facility provides the capability of characterizing the surface emissive and reflective properties of IR paints and materials. Measurements are made on transmittance, specular reflectance, diffuse reflectance, and bidirectional reflectance.

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Infrared (IR) Missile Simulator and Development Laboratory

Infrared Missile Simulator and Development Laboratory

FUNCTION: Determines the effectiveness of ship-based infrared (IR) decoys and IR laser countermeasure (CM) systems against the IR guided antiship missiles (ASM). Develops performance bounds of IR ASMs to detect and engage both conventional and signature-reduced U.S. surface platforms and to evaluate the performance of various IRCM techniques from research and development to development test (DT)/operational test (OT).

INSTRUMENTATION: An extensive array of optical and electronic analysis equipment supports the development, test, and operation of the IR simulators. Test and analysis of much of the electronics is accomplished through custom interfaces coupled to portable computer-based data acquisition subsystems. Software development facilities are a major feature of the simulators that use both high-level and assembly-level code for real-time operations. A high-performance emulation environment makes development of this complex code possible.

DESCRIPTION: The IR Missile Simulator and Development Laboratory includes IR seeker simulators and a fully equipped laboratory for sensor evaluation, processor design and development, flight hardware assembly, algorithm design, and data analysis. The aircraft-mounted systems use fiber-optic communications between wing pod and the instrumentation/display inside the aircraft. This provides low noise on all data channels. The simulator systems contain an integrated data system for analysis of extensive field trials and allow ready visualization of both the actual tests and post-test data reduction. One simulator is a reprogrammable system permitting evaluation of multiple threats. Detector configurations and algorithms are changed to approximate threats. Another flyable simulator supports research on imaging IR seekers. The large system gimbal accommodates newly developed imaging IR cameras. By using commercial image processing boards and an array of microprocessors, a complete missile seeker system with exceptional flexibility to incorporate new algorithms and IRCCM approaches is obtained.

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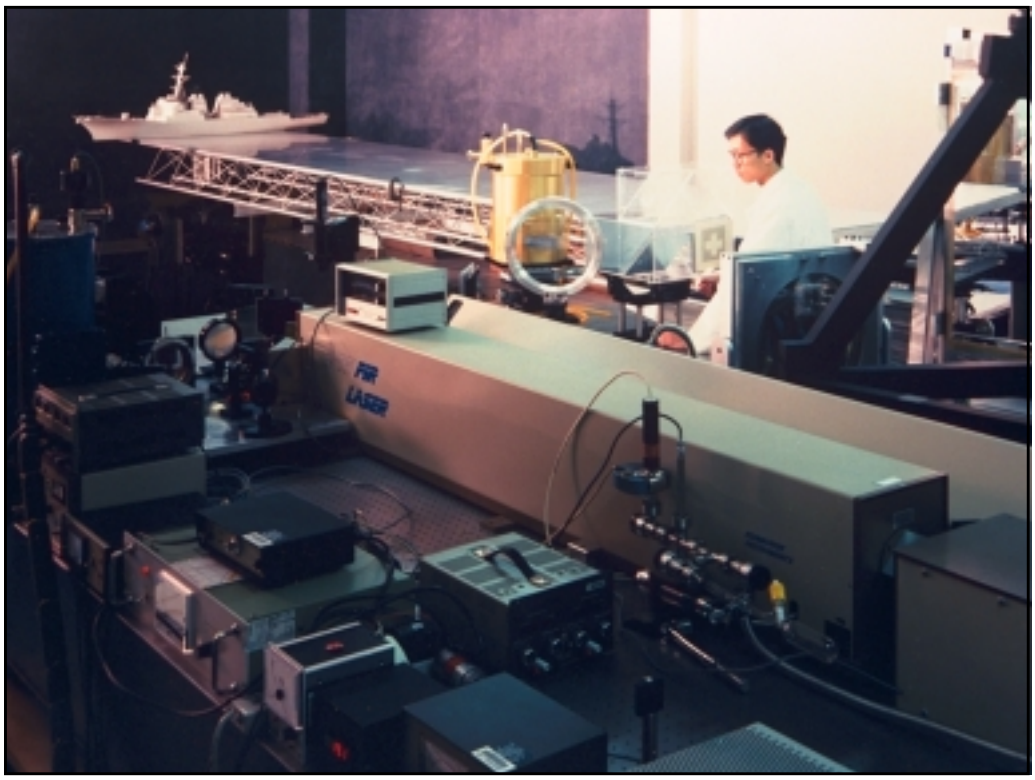
Scale Model Analysis Facility (SMAF)



Scale Model Analysis Facility

FUNCTION: Uses reduced-scale models and a submillimeter (SMM) laser and detection system to measure and analyze the radar cross section (RCS) of ships and ship systems.

INSTRUMENTATION: The radar analog is a homodyne system with a continuous wave SMM laser transmitter and a liquid helium cooled, bolometer receiver. Target translation and orientation are with a high-precision, six degree-of-freedom (DOF) positioning stage. A high-quality SMM absorption material reduces the background signals in the anechoic chamber. A simulated sea surface adds the multipath effect between the target and the sea. A stereo lithography system adds to the capability of model construction.

DESCRIPTION: The Scale Model Analysis Facility (SMAF) is an efficient method of measuring and analyzing the RCS of objects through an accurate scaling of the object, the radar system, and the environment. For ship models, mid X-band studies require SMAF to operate in the SMM region. Lower scaling ratios permit more detailed study of structures, such as radars or weapon systems. The SMAF range includes a SMM radar analog and an anechoic chamber. During measurement, the model is illuminated by a narrow SMM beam, while translating in a raster pattern in the anechoic chamber. Backscattered energy is collected as a function of elevation and cross range until the entire model has been swept. Processed data produce high-resolution radar images from which locations in cross range and elevation, magnitudes, and angular persistencies of the major scattering centers on the target can be accurately assessed.

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Secure Supercomputing Facility (SSF)

Secure Supercomputing Facility

FUNCTION: Provides NRL, the Navy, and DoD with a high-speed, large-memory computation facility for classified projects. Throughput is comparable to a dozen Cray XMPs with large solid-state disks and can complete a year of VAX 11/780 runs within a matter of minutes to seconds. The SSF primarily addresses requirements for GENSER Secret, Top Secret, and material requiring special controls.

INSTRUMENTATION: Secure Supercomputing Facility (SSF) visitors are accommodated in spaces featuring high-performance workstations, X/terminals and PCs, and a complement of printers. A rich set of productivity tools are available including: X/windows and Motif graphical user interfaces, a full set of UNIX network connectivity tools, industry standard editors, UNIX tools and debuggers, high-performance Math libraries, parallel and distributed programming tools, data visualization, and multimedia tools.

DESCRIPTION: The SSF centerpiece is a 16-processor SGI Power Challenge with each processor achieving 300 Mflops, and with 16 GB of physical memory and 24 GB virtual memory. Local disk storage (>70 GB) uses removable Winchester disk cassettes. The facility's computational capability is supplemented by an SGI Origin 2000 system with 16 advanced processors that each achieve 400 Mflops and 8 GB physical memory. The SSF includes a fully automated, extensible network file server with a storage of >500 GB. Access to the SSF is restricted to workspaces within the controlled perimeter of the Tactical Warfare Division (TEWD) building complex. Normally, the SSF runs tasks through GENSER Secret and may be accessed workspaces via the TEWD network. For more highly controlled projects, the SSF Power Challenge and vault enclosure become dedicated to the particular project. Each project uses its own exclusive complement of removable disk cassettes as well as system and application software.

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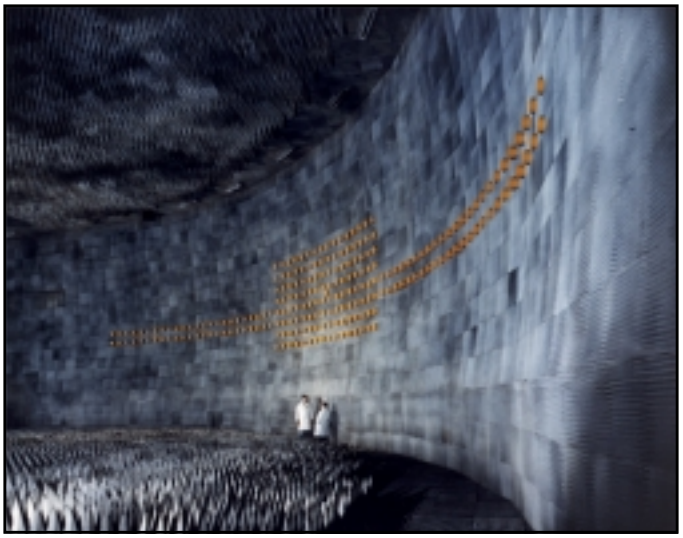
Central Target Simulator (CTS) Facility



Central Target Simulator Facility

FUNCTION: A high-performance, hardware-in-the-loop simulator for real-time closed-loop testing and evaluation of electronic warfare (EW) systems and techniques to counter the antiship missile threat to the U.S. Navy in the 8.0 to 18.0 GHz frequency range. Tests use actual missile hardware and closure rates, enabling test results to be reported in the form of hit/miss distances. In addition, open-loop characterization tests evaluate the capabilities of threat systems and contribute data to the threat simulator validation process.

INSTRUMENTATION: The facility uses general laboratory instrumentation and recording equipment to display and capture information relative to the tests being conducted. The simulation computer stores pertinent information from the scenario, along with 16 analog channels and 32 digital bits captured from the missile radar. A coupling capacitor voltage transformer (CCTV) system allows remote displays to be viewed in the control room and throughout the facility, with recording via two VCRs. Communication is provided by a dedicated audio intercom.

DESCRIPTION: The Central Target Simulator (CTS) Facility is built around a 114 ft × 127 ft × 38 ft high shielded anechoic chamber. A spherical array of 225 dual-polarized antennas is used to simulate the radio frequency (RF) environment that the missile encounters in an engagement. Two feed networks distribute time and/or space coincident signals. The RF generation subsystem is synchronized to the missile radar in time and frequency. State-of-the-art modulation equipment replicates the characteristics of ship and decoy echoes, correctly triggering target discriminants. External inputs allow jamming signals or waveforms to be included. Missile hardware is mounted 75 ft from the array on a three-axis flight motion simulator. The loop between the missile and the facility is closed through a Silicon Graphics Challenger computer. This computer is programmed with a 6-DOF aerodynamics/autopilot model that interacts with the guidance hardware in response to the RF stimuli. Simulations run in real time at update rates of up to 200 Hz. A battery of open-loop characterization tests is used to evaluate the performance of the missile radar subsystems, identifying design features, vulnerabilities, or limitations for potential exploitation by EW tactics and techniques.

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Flying Electronic Warfare Laboratory

Flying Electronic Warfare Laboratory

FUNCTION: Provides NP-3D aircraft host platforms for Effectiveness of Navy Electronic Warfare Systems (ENEWS) Program antiship missile (ASM) seeker simulators used for electronic warfare (EW) effectiveness assessment in an at-sea environment. This capability provides the Navy's RDT&E and operational communities with unique assets and realistic methods for evaluating surface Navy EW systems.

INSTRUMENTATION: Two NP-3D aircraft are configured to carry the simulators. These simulators represent a large cross section of the threat missile systems available worldwide and are derived from other programs or are hardware systems modified to represent various threat seekers. All of the simulators are unique, one-of-a-kind systems with the associated instrumentation tailored to the individual simulator. GPS and data link systems allow the collection of aircraft and ship's position information for ground truth determination.

DESCRIPTION: The Flying Electronic Warfare Laboratory provides ASM threat representation through the adaptation of a host of missile seeker simulators. Operational testing against ship's EW assets is enhanced through the unique ability to provide real-time feedback of the effectiveness of electronic attack (EA) responses to the threat seeker's stimuli. Fifteen different simulators representing various ASM threat types are available as part of the ENEWS Program. Up to eight simulators can be operated simultaneously to exercise the on/off-board EW assets being tested. Internally mounted equipment racks contain seeker control panels, data displays, data acquisition systems, and communications systems that are organic to each simulator. The Laboratory supports RDT&E and operational activities on a worldwide basis, providing EW testing support to U.S. and NATO programs and those of individual countries.

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